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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
VATHYAM, SUREKHA	

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1753	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)
	10/788,884	YAGER ET AL.
	Examiner	Art Unit
	Surekha Vathyam	1753

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 May 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-133* is/are pending in the application.

4a) Of the above claim(s) *20-133* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *24 August 2004* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *11/23/05, 12/05/05*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of claims 1 – 15 (Group I) in the reply filed on 14 May 2007 is acknowledged. Claims 16 – 19 (Group IV) have been rejoined with claims 1 – 15 (Group I) upon applicant's request. Claims 20 – 133 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention, there being no allowable generic or linking claim.

2. Applicant states that the apparatus of Group II (for example claim 20) is not capable of being used for detecting, because it does not include a specific structure for detecting. However, the specification clearly indicates that a device "comprising" the elements of claim 20 is used for detecting. The open language of the claim permits the claimed apparatus to include additional elements. Also, the concept of "use" of an apparatus is not limited to the apparatus being in isolation, but may involve additionally, devices, products and/or humans. Though the device of Group II is capable of being used for separating, it may also be used otherwise, for example to study the relaxation time of uncharged polar molecules in response to turning on and off the electric field or switching the polarity of the electric field, without any separating.

The requirement is still deemed proper and is therefore made FINAL.

Information Disclosure Statement

3. The information disclosure statement (IDS) filed 11/23/05 and 12/05/05 have some duplicate references, which have been crossed out in the IDS, filed 11/23/05 and the information contained therein has been considered.

Drawings

4. The replacement drawings filed on 24 August 2004 are unacceptable. These drawings have been changed with respect to the originally filed drawings and as a result are inconsistent with the specification. A few examples of these changes include the change in symbols used in figs. 8, 9A, 9B which do not correspond to the explanation of these figs on page 10 of the specification, the legend indicating what each symbol denotes is swapped in fig. 9A thereby changing the results obtained, fig. 3B is positioned too close to fig. 3A, making the reference character "126" not be discernable, fig. 11 has the notation "m = 5" missing.

5. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: "123" (page 11, paragraph beginning with "Figure 3A", line 5).

6. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: "224" in fig. 5.

7. Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with

37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

8. In addition to Replacement Sheets containing the corrected drawing figure(s), applicant is required to submit a marked-up copy of each Replacement Sheet including annotations indicating the changes made to the previous version. The marked-up copy must be clearly labeled as "Annotated Sheets" and must be presented in the amendment or remarks section that explains the change(s) to the drawings. See 37 CFR 1.121(d)(1). Failure to timely submit the proposed drawing and marked-up copy will result in the abandonment of the application.

Specification

9. The disclosure is objected to because of the following informalities: The amended specification filed 27 February 2004, page 1, line 5, the phrase "filed May 26, 200 (now pending);" should be corrected to - - filed May 26, 2000 (now abandoned); - -.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

11. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

12. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

13. Claims 1 – 3, 5 – 7, 9 – 19 are rejected under 103(a) as being unpatentable over Batchelder (US 4,390,403) in view of Parce (US 5,699,157).

Regarding claim 1, Batchelder ('403) discloses a device (see figs. 1 – 6A) for detecting charged particles in a fluid (column 2, lines 13 – 15, column 7, lines 66 – column 8, line 7, column 8, line 45 – column 9, line14 and column 3, lines 42 – 48) comprising: a) a microchannel (see figs. 1, 2, 2A, 3A, 3C and column 7, lines 3 – 8) comprising an inlet (40) for introducing said fluid into said microchannel (column 7, lines 9 – 34); b) a pair of electrodes (2, 12, 14, 16, 18, 20, 22, 28, 50, 52, 54, 56, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78) for applying a voltage to produce an electrical field across said microchannel orthogonal to the length of said microchannel(see figs.1 and 2A and column 4, lines 10 – 43); and c) means for detecting said charged particles within said microchannel after application of said voltage (column 7, line 66 – column 8, line 7 and column 8, line 45 – column 9, line 14).

Batchelder ('403) does not expressly disclose the detection means detecting the position of said charged particles.

Parce ('157) teaches a device for detecting the position (figs. 2A – 4, column 2, lines 17 – 34 and column 6, line 12 – column 9, line 7) of charged particles in a fluid (column 4, lines 21 – 33, column 6, lines 29 – 24) within a microchannel (column 3, lines 46 – 54).

It would have been obvious to one of ordinary skill in the art to modify the detection means of Batchelder ('403) to detect the position of charged particles as taught by Parce ('157) because as Parce ('157) explains the signals obtained from the

particles being detected are collected at various positions within the microchannel and are averaged over time leading to better signal to noise ratio than signals obtained from a single observation at a single detection point (column 8, line 65 – column 9, line 2).

Regarding claim 2, Parce ('157) teaches the device also comprising means for identifying said charged particles by correlating the detected position of said charged particles with the position of charged particles of known identity (column 7, lines 8 – 31).

Regarding claim 3, Batchelder ('403) discloses the device also comprising means for determining the initial concentration of said particles in said fluid (column 8, line 45 – column 9, line 13).

Regarding claim 5, Batchelder ('403) discloses the device wherein the microchannel comprises a fluid (column 3, lines 47 – 48), and a concentration gradient is formed across the channel (column 6, lines 10 – 16).

Regarding claim 6, Batchelder ('403) discloses the device wherein the distance between said electrodes is from about 10 μm to no greater than about 5 mm (column 7, lines 5 – 8).

Regarding claim 7, Batchelder ('403) discloses the device wherein said electrodes form walls of said microchannel (see fig. 1 and column 4, lines 50 – 55).

Regarding claim 9, Batchelder ('403) discloses the device also comprising quantitation means for determining the concentration of said particles (column 8, line 45 – column 9, line 13).

Regarding claim 10, Batchelder ('403) discloses the device wherein said microchannel contains said fluid, and said electrodes are prevented from direct contact with said fluid by a layer of sheath fluid in laminar flow with said fluid (column 5, lines 3 – 25).

Regarding claim 11, Batchelder ('403) discloses the device wherein said microchannel contains a fluid comprising particles having differing electrophoretic mobilities (column 3, lines 8 – 26).

Regarding claim 12, Batchelder ('403) discloses the device wherein said means for detecting is capable of detecting the position of a plurality of particles having differing electrophoretic mobilities within said channel after application of said voltage (column 8, lines 6 – 7).

Regarding claim 13, Batchelder ('403) discloses the device also comprising means for changing the polarity of said electric field (column 4, lines 10 – 43).

Regarding claim 14, Batchelder ('403) discloses the device wherein said device comprises one or more additional sets of electrodes (12, 14, 16, 18, 20, 22, 28, 50, 52, 54, 56, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78) positioned downstream from said pair of electrodes (see figs. 2, 2A, 3A, 3C, 6).

Regarding claim 15, Batchelder ('403) discloses the device wherein at least one additional set of electrodes has a polarity opposite to that of said pair of electrodes (see figs. 2A, 3A, 3C).

Regarding claim 16, Batchelder ('403) discloses a method for detecting charged particles in a fluid (column 2, lines 13 – 15, column 7, lines 66 – column 8, line 7, column 8, line 45 – column 9, line14 and column 3, lines 42 – 48) comprising: a) introducing a fluid containing charged particles into a microchannel through an inlet (column 7, lines 3 – 34, column 3, lines 42 – 48); b) applying a voltage to produce an electrical field across said microchannel orthogonal to the length of said microchannel to cause said charged particles to migrate to a position in said microchannel (column 4, lines 10 – 43); and c) detecting said charged particles within said microchannel after application of said voltage (column 7, line 66 – column 8, line 7 and column 8, line 45 – column 9, line 14).

Batchelder ('403) does not expressly disclose detecting the position of said charged particles.

Parce ('157) teaches a method for detecting the position (figs. 2A – 4, column 2, lines 17 – 34 and column 6, line 12 – column 9, line 7) of charged particles in a fluid (column 4, lines 21 – 33, column 6, lines 29 – 24) within a microchannel (column 3, lines 46 – 54).

It would have been obvious to one of ordinary skill in the art to modify the detection step of Batchelder ('403) to detect the position of charged particles as taught by Parce ('157) because as Parce ('157) explains the signals obtained from the particles being detected are collected at various positions within the microchannel and are averaged over time leading to better signal to noise ratio than signals obtained from a single observation at a single detection point (column 8, line 65 – column 9, line 2).

Regarding claim 17, Batchelder ('403) discloses the method also comprising reversing the polarity of said voltage (column 4, lines 10 – 43).

Regarding claim 18, Batchelder ('403) discloses the method comprising reversing the polarity of said voltage a plurality of times (column 4, lines 10 – 43).

Regarding claim 19, Batchelder ('403) discloses the method comprising applying different voltages or polarities to said microchannel at different points along its length (column 4, lines 10 – 43).

14. Claims 1 – 2, 5 – 12, 14 and 16 are rejected under 35 U.S.C. 103(a) as being obvious over Frazier et al. (US 6,136,171) in view of Parce (US 5,699,157).

Regarding claim 1, Frazier ('171) discloses a device (see fig. 3) for detecting charged particles in a fluid (column 1, lines 13 – 18, column 2, lines 1 – 12 and column 12, lines 35 – 43) comprising: a) a microchannel (20, 75) comprising an inlet (24, 72) for introducing said fluid into said microchannel (column 4, lines 15 – 17 and column 9, lines 5 – 22); b) a pair of electrodes (21, 22, 78) for applying a voltage to produce an electrical field across said microchannel orthogonal to the length of said microchannel (see fig. 7 and column 6, lines 58 – 62, column 10, lines 25 – 28); and c) means for detecting (46, 82) said charged particles within said microchannel after application of said voltage (column 7, lines 41 – 59, column 16, lines 55 – 65).

Frazier ('171) does not expressly disclose the detection means detecting the position of said charged particles.

Parce ('157) teaches a device for detecting the position (figs. 2A – 4, column 2, lines 17 – 34 and column 6, line 12 – column 9, line 7) of charged particles in a fluid (column 4, lines 21 – 33, column 6, lines 29 – 24) within a microchannel (column 3, lines 46 – 54).

It would have been obvious to one of ordinary skill in the art to modify the detection means of Frazier ('171) to detect the position of charged particles as taught by Parce ('157) because as Parce ('157) explains the signals obtained from the particles being detected are collected at various positions within the microchannel and are averaged over time leading to better signal to noise ratio than signals obtained from a single observation at a single detection point (column 8, line 65 – column 9, line 2).

Regarding claim 2, Parce ('157) teaches the device also comprising means for identifying said charged particles by correlating the detected position of said charged particles with the position of charged particles of known identity (column 7, lines 8 – 31).

Regarding claim 5, Frazier ('171) discloses the device wherein the microchannel comprises a fluid (column 7, lines 18 – 34), and a concentration gradient is formed across the channel (see fig. 7 and column 9, lines 16 – 19, column 10, lines 25 – 45).

Regarding claim 6, Frazier ('171) discloses the device wherein the distance between said electrodes is from about 10 μm to no greater than about 5 mm (column 6, line 64 – column 7, line 12).

Regarding claim 7, Frazier ('171) discloses the device wherein said electrodes form walls of said microchannel (column 6, lines 48 – 62).

Regarding claim 8, Frazier ('171) discloses the device wherein said electrodes are capable of applying a voltage from about 0.1 V to no greater than about 5 V (column 9, lines 9 – 14).

Regarding claim 9, Frazier ('171) discloses the device also comprising quantitation means for determining the concentration of said particles (see figs. 14 and 15 and column 1, lines 34 – 37, column 7, lines 41 – 59, column 12, lines 35 – 43, column 17, line 41 – column 18, line 7).

Regarding claim 10, Frazier ('171) discloses the device wherein said microchannel contains said fluid, and said electrodes are prevented from direct contact with said fluid by a layer of sheath fluid in laminar flow with said fluid (column 2, lines 31 – 39, column 10, lines 42 – 45).

Regarding claim 11, Frazier ('171) discloses the device wherein said microchannel contains a fluid comprising particles having differing electrophoretic mobilities (column 2, lines 1 – 12, column 9, lines 16 – 22, column 10, lines 46 – 65).

Regarding claim 12, Frazier ('171) discloses the device wherein said means for detecting is capable of detecting the position of a plurality of particles having differing electrophoretic mobilities within said channel after application of said voltage (see figs. 14 and 15 and column 17, line 41 – column 18, line 7).

Regarding claim 14, Frazier ('171) discloses the device wherein said device comprises one or more additional sets of electrodes (82) positioned downstream from said pair of electrodes (see fig. 10).

Regarding claim 16, Frazier ('171) discloses a method for detecting charged particles in a fluid (column 1, lines 13 – 18, column 2, lines 1 – 12 and column 12, lines 35 – 43) comprising: a) introducing a fluid containing charged particles into a microchannel through an inlet (column 4, lines 15 – 17 and column 9, lines 5 – 22); b) applying a voltage to produce an electrical field across said microchannel orthogonal to the length of said microchannel to cause said charged particles to migrate to a position in said microchannel (see fig. 7 and column 6, lines 58 – 62, column 10, lines 25 – 28); and c) detecting said charged particles within said microchannel after application of said voltage (column 7, lines 41 – 59, column 16, lines 55 – 65).

Frazier ('171) does not expressly disclose detecting the position of said charged particles.

Parce ('157) teaches a method for detecting the position (figs. 2A – 4, column 2, lines 17 – 34 and column 6, line 12 – column 9, line 7) of charged particles in a fluid (column 4, lines 21 – 33, column 6, lines 29 – 24) within a microchannel (column 3, lines 46 – 54).

It would have been obvious to one of ordinary skill in the art to modify the detection step of Frazier ('171) to detect the position of charged particles as taught by Parce ('157) because as Parce ('157) explains the signals obtained from the particles being detected are collected at various positions within the microchannel and are averaged over time leading to better signal to noise ratio than signals obtained from a single observation at a single detection point (column 8, line 65 – column 9, line 2).

15. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Batchelder (US 4,390,403) in view of Parce (US 5,699,157) as applied to claim 1 above, and further in view of Giddings (US 4,737,268).

Regarding claim 4, Batchelder ('403) in view of Parce ('157) discloses the microchannel comprises a fluid (column 3, lines 47 – 48) but does not explicitly disclose a pH gradient is formed across said fluid.

Giddings ('268) teaches a device (see figs. 1 – 8) for separating charged particles in a fluid (column 2, lines 47 – 68) comprising a microchannel (11) comprising an inlet (25) for introducing said fluid into said microchannel and a means for producing special field or gradient or combination thereof across said microchannel orthogonal to the length of said microchannel (column 2, lines 47 – 68). Giddings ('268) teaches a preferred combination of pH gradients with electrical field (column 9, lines 11 – 25).

It would have been obvious to one of ordinary skill in the art to modify the fluid of Batchelder ('403) in view of Parce ('157) to include the formation of a pH gradient as taught by Giddings ('268) because the combination of the electric field and pH gradient as a driving force will effect the movement of particle fractions to different transverse equilibrium positions and increase resolution and throughput as explained by Giddings ('268) (column 9, lines 5 – 25).

16. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Frazier et al. (US 6,136,171) in view of Parce (US 5,699,157) as applied to claim 1 above, and further in view of Giddings (US 4,737,268).

Regarding claim 4, Frazier ('171) in view of Parce ('157) discloses the microchannel comprises a fluid (column 7, lines 18 – 34) but does not explicitly disclose a pH gradient is formed across said fluid.

Giddings ('268) teaches a device (see figs. 1 – 8) for separating charged particles in a fluid (column 2, lines 47 – 68) comprising a microchannel (11) comprising an inlet (25) for introducing said fluid into said microchannel and a means for producing special field or gradient or combination thereof across said microchannel orthogonal to the length of said microchannel (column 2, lines 47 – 68). Giddings ('268) teaches a preferred combination of pH gradients with electrical field (column 9, lines 11 – 25).

It would have been obvious to one of ordinary skill in the art to modify the fluid of Frazier ('171) in view of Parce ('157) to include the formation of a pH gradient as taught by Giddings ('268) because the combination of the electric field and pH gradient as a driving force will effect the movement of particle fractions to different transverse equilibrium positions and increase resolution and throughput as explained by Giddings ('268) (column 9, lines 5 – 25).

17. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Batchelder (US 4,390,403) in view of Parce ('157) as applied to claim 1 above, and further in view of Frazier et al. (US 6,136,171).

Regarding claim 8, Batchelder ('403) in view of Parce ('157) discloses the device wherein said electrodes are capable of applying a voltage (column 3, lines 55 – 57). However, Batchelder ('403) in view of Parce ('157) does not explicitly disclose the range of the voltage applied.

Frazier ('171) teaches a device (see fig. 3) for detecting charged particles in a fluid (column 1, lines 13 – 18, column 2, lines 1 – 12 and column 12, lines 35 – 43) comprising: a) a microchannel (20, 75) comprising an inlet (24, 72) for introducing said fluid into said microchannel (column 4, lines 15 – 17); b) a pair of electrodes (21, 22, 78) for applying a voltage to produce an electrical field across said microchannel orthogonal to the length of said microchannel (see fig. 7 and column 6, lines 58 – 62, column 10, lines 25 – 28); and c) means for detecting (46, 82) said charged particles within said microchannel after application of said voltage (column 7, lines 41 – 59, column 16, lines 55 – 65); wherein said electrodes are capable of applying a voltage from about 0.1 V to no greater than about 5 V (column 9, lines 9 – 14).

It would have been obvious to one of ordinary skill to use the applied voltage range taught by Frazier ('171) in the electrodes of the device of Batchelder ('403) in view of Parce ('157) because as Frazier ('171) explains that applying a low voltage across the electrodes helps avoid the detrimental effects of electrolysis (column 9, lines 11 – 14).

18. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Frazier et al. (US 6,136,171) in view of Parce (US 5,699,157) as applied to claim 1 above, and further in view of Stevens (US 5,133,844).

Regarding claim 13, Frazier ('171) in view of Parce ('157) discloses the electrodes being connected to a DC power supply (column 13, lines 61 – 63) and further teaches that the polarity of the electric field is a variable to be optimized (column 2, lines 23 – 30). Frazier ('171) in view of Parce ('157) does not explicitly disclose a means for changing the polarity of electric field.

Stevens ('844) teaches a device (see figs. 1A, 1B) for separating charged particles in a fluid (column 3, lines 7 – 9) comprising: a microchannel (13) comprising an inlet (15) for introducing said fluid into said microchannel (column 5, lines 2 – 7); a pair of electrodes (21) for applying a voltage to produce an electrical field across said microchannel orthogonal to the length of said microchannel (column 5, lines 23 – 41); and a means for changing the polarity of said electric field (23) (column 5, lines 27 – 33).

It would have been obvious to one of ordinary skill in the art to adapt the power supply of Frazier ('171) in view of Parce ('157) to effect a change in polarity of the electric field as taught by Stevens ('844) because by reversing the electric field in a time-dependent manner like a waveform, the amplitude, periodicity and shape of the waveform may all be varied to obtain better separation of different solute species as explained by Stevens ('844) (column 3, line 10 – column 4, line 9).

19. Claims 3, 15 and 17 – 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Frazier et al. (US 6,136,171) in view of Parce (US 5,699,157) as applied to claim 1 above, and further in view of Batchelder (US 4,390,403).

Regarding claim 3, Frazier ('171) in view of Parce ('157) discloses the device providing quantitative separation of particles (column 1, lines 34 – 37) and "on-chip" detection means including optical detectors to monitor fluid in real time (see fig. 15), interfaced with analysis means such as a personal computer for subsequent data analysis (column 7, lines 41 – 59). Frazier ('171) in view of Parce ('157) does not expressly disclose the device comprising means for determining the initial concentration of said particles in said fluid.

Batchelder ('403) teaches a device (see figs. 1 – 6A) for detecting charged particles in a fluid (column 2, lines 13 – 15, column 7, lines 66 – column 8, line 7, column 8, line 45 – column 9, line14 and column 3, lines 42 – 48) comprising: a) a microchannel (see figs. 1, 2, 2A, 3A, 3C and column 7, lines 3 – 8) comprising an inlet (40) for introducing said fluid into said microchannel (column 7, lines 9 – 34); b) a pair of electrodes (2, 12, 14, 16, 18, 20, 22, 28, 50, 52, 54, 56, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78) for applying a voltage to produce an electrical field across said microchannel orthogonal to the length of said microchannel(see figs.1 and 2A and column 4, lines 10 – 43); and c) means for detecting the position of said charged particles within said microchannel after application of said voltage (column 7, line 66 – column 8, line 7 and column 8, line 45 – column 9, line 14). Batchelder ('403) also teaches the device

comprising means for determining the initial concentration of said particles in said fluid (column 8, line 45 – column 9, line 13).

It would have been obvious to one of ordinary skill in the art to use the detection and analysis means of Frazier ('171) in view of Parce ('157) to determine the initial concentration of said particles in said fluid using the teachings of Batchelder ('403) because it enables computational determination of initial concentration based on data obtained in combination with experimental parameters used as explained by Batchelder ('403) (column 8, line 68 – column 9, line 3).

Frazier ('171) in view of Parce ('157) discloses the device as discussed with regards to claim 14. Regarding claim 15, Frazier ('171) in view of Parce ('157) does not explicitly disclose the at least one additional set of electrodes (82) has a polarity opposite to that of said pair of electrodes (78).

Batchelder ('403) teaches a device wherein one or more additional sets of electrodes (12, 14, 16, 18, 20, 22, 28, 50, 52, 54, 56, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78) are positioned downstream from said pair of electrodes (see figs. 2, 2A, 3A, 3C, 6) and at least one additional set of electrodes has a polarity opposite to that of said pair of electrodes (see figs. 2A, 3A, 3C).

It would have been obvious to one of ordinary skill in the art to make the polarity of the at least one additional set of electrodes be opposite to that of said pair of electrodes in the device of Frazier ('171) in view of Parce ('157) as taught by Batchelder ('403) because as Batchelder ('403) explains the varying of charges on the electrodes

can be used to control or assist the movement of material in the microchannel (column 6, lines 10 – 16).

Frazier ('171) in view of Parce ('157) discloses the method as discussed with regards to claim 16. Regarding claims 17 – 19, Frazier ('171) in view of Parce ('157) does not explicitly disclose the method comprising reversing polarity of said voltage (claim 17) a plurality of times (claim 18) or applying different voltages or polarities to said microchannel at different points along its length (claim 19).

Batchelder ('403) teaches a method for detecting charged particles in a fluid (column 2, lines 13 – 15, column 7, lines 66 – column 8, line 7, column 8, line 45 – column 9, line14 and column 3, lines 42 – 48) comprising: a) introducing a fluid containing charged particles into a microchannel through an inlet (column 7, lines 3 – 34, column 3, lines 42 – 48); b) applying a voltage to produce an electrical field across said microchannel orthogonal to the length of said microchannel to cause said charged particles to migrate to a position in said microchannel (column 4, lines 10 – 43); and c) detecting said charged particles within said microchannel after application of said voltage (column 7, line 66 – column 8, line 7 and column 8, line 45 – column 9, line 14).

Regarding claim 17, Batchelder ('403) discloses the method also comprising reversing the polarity of said voltage (column 4, lines 10 – 43).

Regarding claim 18, Batchelder ('403) discloses the method comprising reversing the polarity of said voltage a plurality of times (column 4, lines 10 – 43).

Regarding claim 19, Batchelder ('403) discloses the method comprising applying different voltages or polarities to said microchannel at different points along its length (column 4, lines 10 – 43).

It would have been obvious to one of ordinary skill in the art to modify the method of Frazier ('171) in view of Parce ('157) to include the step of reversing the polarity of said voltage (claim 17) a plurality of times (claim 18) or applying different polarities to the microchannel at different points along its length (claim 19) as taught by Batchelder ('403) because as Batchelder ('403) explains the varying of charges on the electrodes can be used to control or assist the movement of material in the microchannel (column 6, lines 10 – 16).

Conclusion

20. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Caldwell et al. (US 5,240,618) disclose a device similar to the device of claim 1.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Surekha Vathyam whose telephone number is 571-272-2682. The examiner can normally be reached on 7:30 AM to 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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